

(Model.)

2 Sheets—Sheet 1.

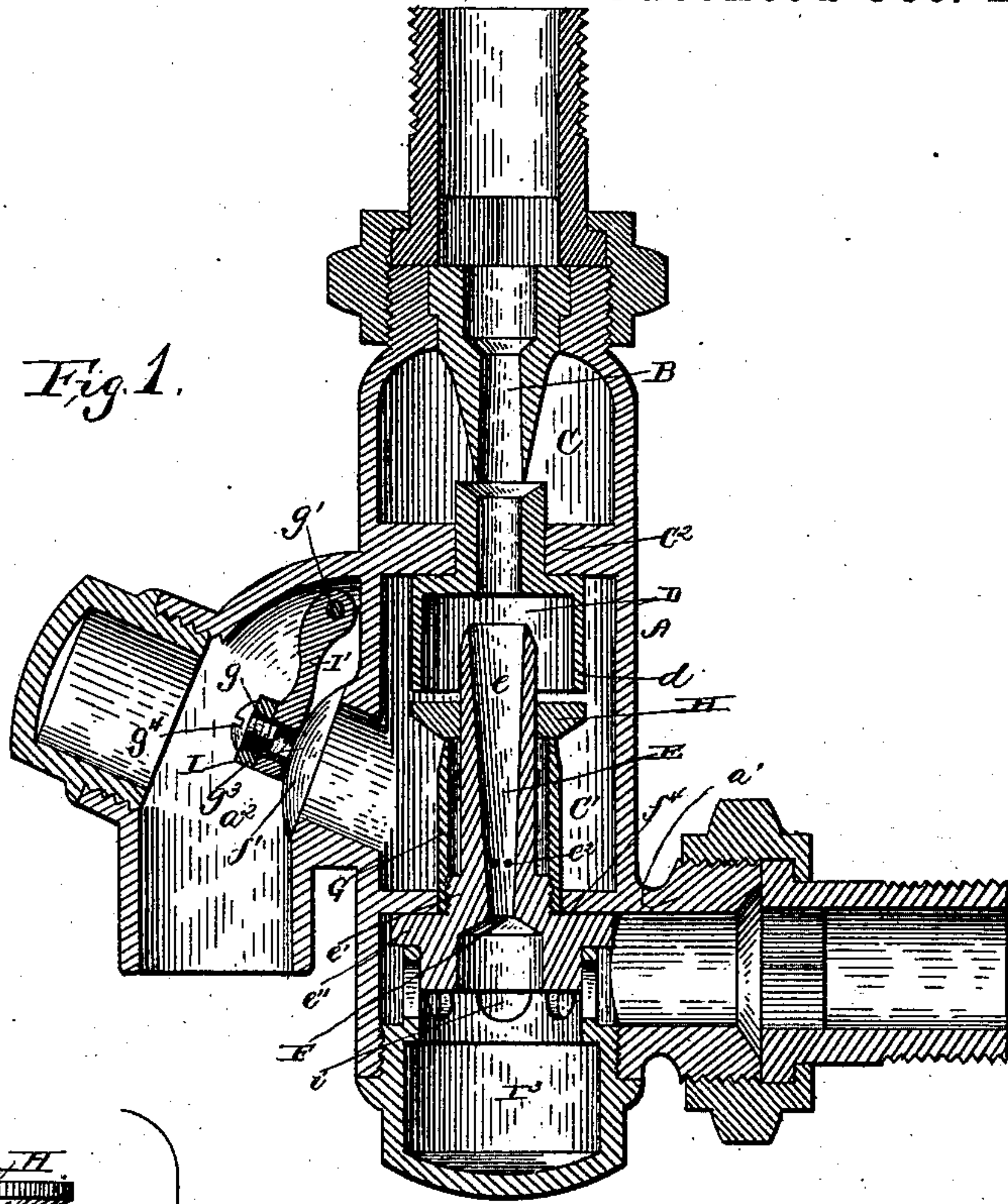
J. DESMOND.

INJECTOR.

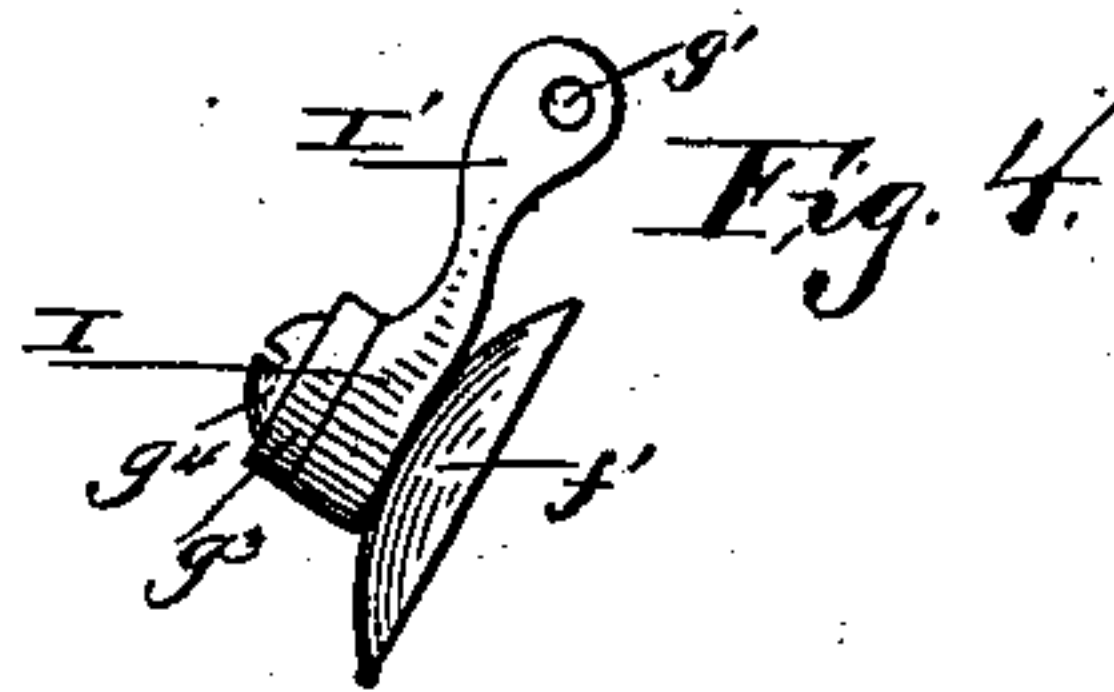
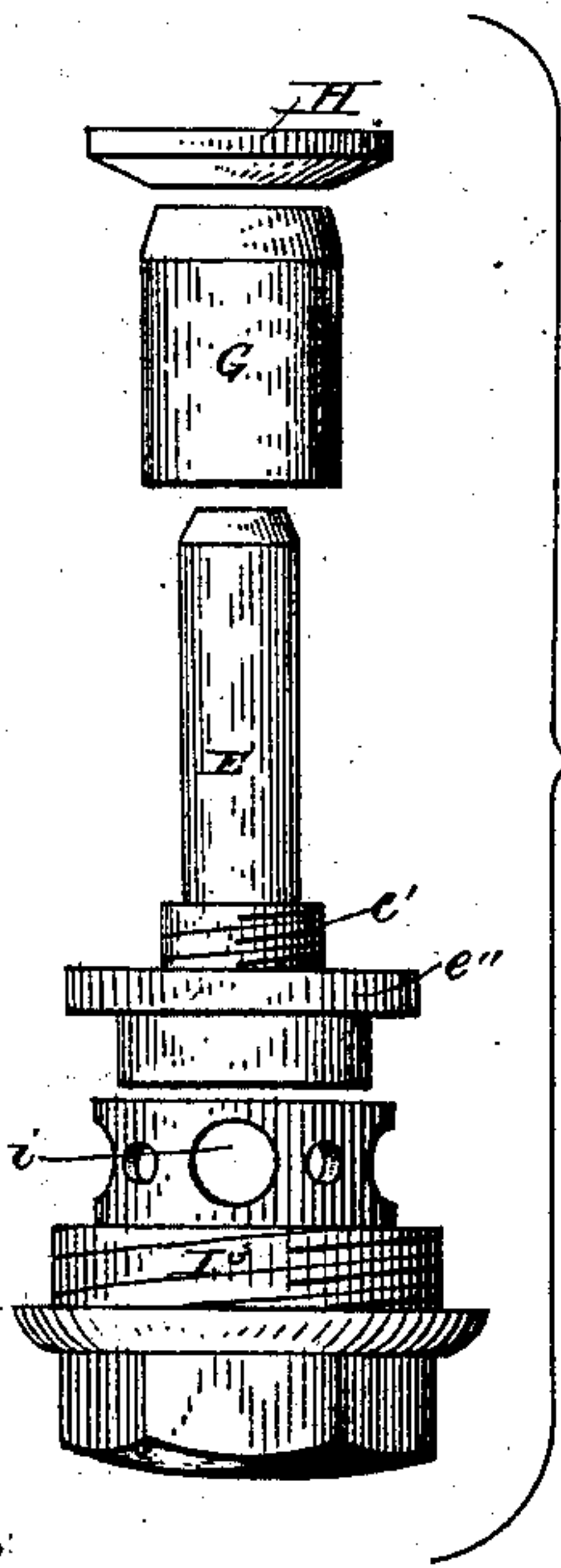
No. 372,209.

Patented Oct. 25, 1887.

*Fig. 1.*



*Fig. 3.*



Witnesses:  
John Enders Jr.  
E. H. Connor

Inventor:  
John Desmond,  
By *[Signature]*  
Attorneys;

(Model.)

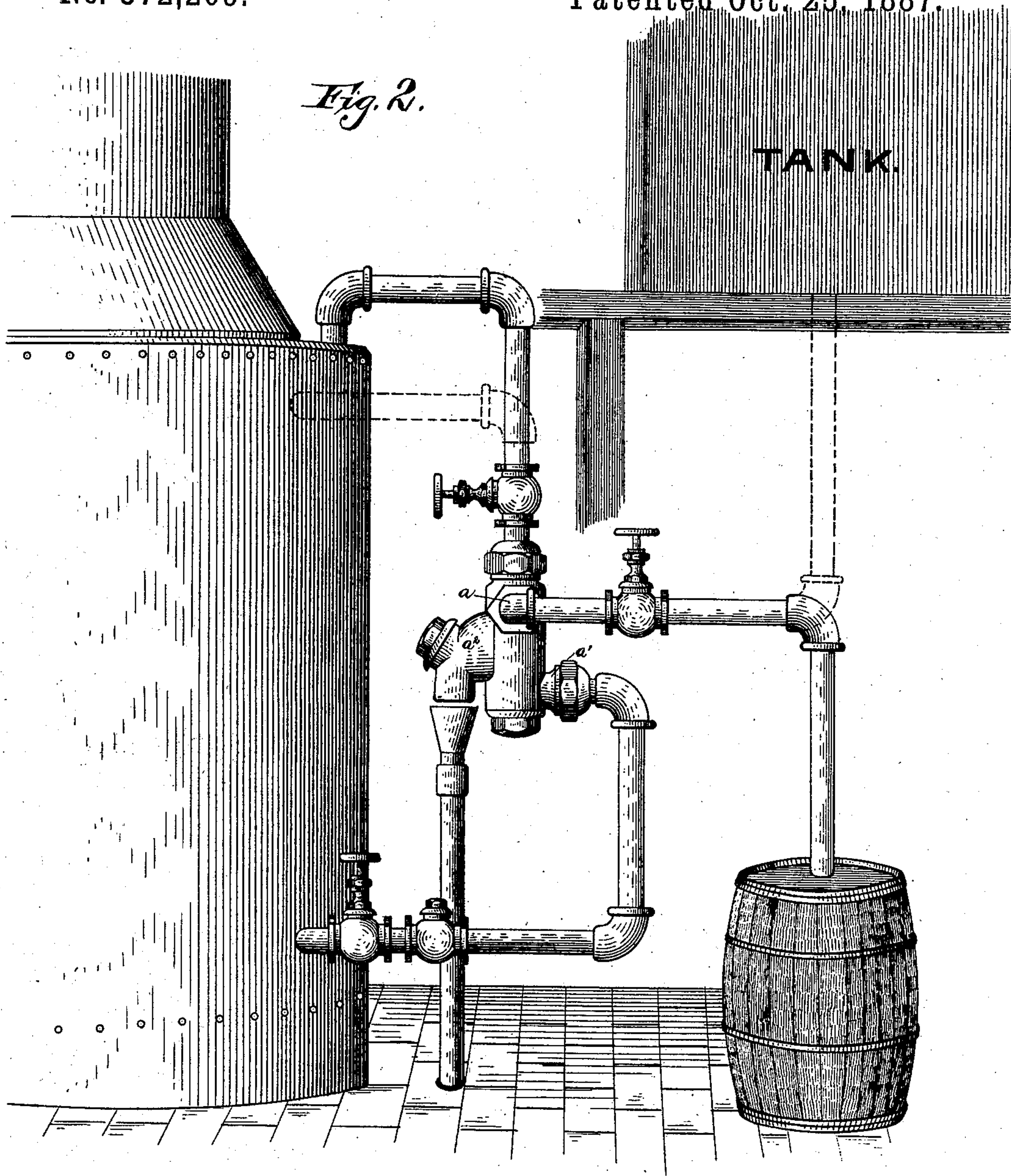
2 Sheets—Sheet 2.

J. DESMOND.  
INJECTOR.

No. 372,209.

Patented Oct. 25, 1887.

*Fig. 2.*



Witnesses;  
*John Enders Jr.*  
*E. H. Connor*

Inventor;  
*John Desmond,*  
By *Ames & Co.*  
Attorneys;



# UNITED STATES PATENT OFFICE.

JOHN DESMOND, OF DETROIT, MICHIGAN, ASSIGNOR TO THE PENBERTHY INJECTOR COMPANY, OF SAME PLACE.

## INJECTOR.

SPECIFICATION forming part of Letters Patent No. 372,209, dated October 25, 1887.

Application filed May 11, 1887. Serial No. 237,820. (Model.)

*To all whom it may concern:*

Be it known that I, JOHN DESMOND, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Steam-Injectors, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention pertains to certain new and useful improvements in steam-injectors; and it consists in the detailed construction, combination, and arrangement of the parts, substantially as hereinafter fully set forth, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical sectional view of my invention. Fig. 2 is an outside view thereof, and Figs. 3 and 4 are details.

In carrying out my invention I employ a casting or tubular casing, A, having three laterally-projecting arms,  $a$   $a'$   $a''$ , the arm  $a$  being formed in one side thereof and having, in practice, suitable connection, by a separable screw-threaded pipe-section, with a water-pipe leading from the source or supply of water. The branch or arm  $a'$ , extending from the lower portion of the casting or tubular casing, near one end thereof, has a separable screw-threaded pipe-section, for the connection thereto of a pipe leading to the boiler to be supplied with water, and in one side of the tubular casting or casing is formed the branch or arm  $a''$ , wherein is secured the overflow-valve.

Within the steam-supply end of the casing A is secured the steam-jet pipe B, the same having a slightly contracted inner end, the passage thereof flaring from a point near its center to said end, as shown in Fig. 1.

The casting or tubular casing A comprises a water supply chamber, C, and an overflow-water chamber, C', the same being separated by an apertured wall, C<sup>2</sup>, wherein is rigidly secured the lifting-tube D, which has formed with its inner end a circular chamber or ring,  $d$ , which bears against one side of said apertured wall, the purpose of which will soon appear.

E is the combining-tube, which has a central tapering aperture,  $e$ , and at its lower end, where said combining-tube is formed inte-

gral with the delivery-tube F, are a series of small apertures, the office of which will soon appear. Immediately adjoining these apertures is formed a screw-threaded thickened portion,  $e'$ , of the delivery-tube, and adjacent this screw threaded portion is a large ring or washer,  $e''$ , formed integral, and its lower portion is narrowed, forming a projecting ring-like end, as shown. Over this combining-tube is placed a cylindric casing or jacket, G, slightly larger than the combining-tube, and on its lower inner surface is formed a female screw-thread for securing the same on the correspondingly-threaded portion  $e'$  of the delivery-tube, and this cylindric casing or thimble incloses the combining-tube a portion of its length, as shown.

In practice the upper end of the combining-tube projects within the chamber or ring  $d$  to within a short distance of the central aperture of the lifting-tube D.

H is a small lifting-valve, flat on its upper surface and beveled, as shown, on its under face, and this valve is slipped on the upper end of the narrow combining-tube E, its under beveled side resting on the upper horizontal edge of the cylindric casing or jacket G, closing the opening between the same and the combining-tube; and when thus resting on the casing or thimble a small space is left between the upper horizontal face of the valve and the lower edge of the ring or chamber of the lifting-tube.

The overflow-water chamber C' has a circular flange,  $f^1$ , formed at a point immediately adjacent the inner end of the arm or branch  $a'$ , and against this flange bears the upper surface of the ring or washer  $e''$  of the delivery-tube, the same being retained thereat by means of a plug, I<sup>3</sup>, screwed in the lower portion of the injector, so as to cause its upper edge to bear against the ring or washer. This inner portion of the ring or washer is provided with suitable apertures,  $i$ , to permit the escape of water from the interior of the plug to the branch or arm leading to the boiler, as will appear farther on. Within the lateral curved arm  $a'$  is secured the overflow-valve I, the same consisting of a disk fitting the overflow hole or opening  $f'$ , formed in the wall of the casting or casing at that point, and this disk has a hollow sleeve or cylindric extension,  $g$ , pro-



jecting from its rear side, upon which is passed one end of an arm, I', the other end of said arm being pivoted by a small cross bar or rod, g', secured at its ends in apertured lugs formed on the upper portion of either side wall of the curved lateral arm a'. After passing the end of arm I' on the sleeve or extension g, a small washer, g<sup>3</sup>, is also passed or inserted thereon, and the same are secured in position by means of a small screw, g<sup>4</sup>, screwed into the outer open end of said sleeve or extension, the latter having for this purpose a female screw-thread formed on its inner surface. The outer side of the wall or casing around the overflow hole or opening f' is so formed as to cause the valve, when in its normal position, to occupy a slanting or inclined position, thus always insuring the seating of the disk over the overflow hole or opening. The extension g is screw-threaded, so as to regulate its adjustment on the end of the pivoted arm I'. The curved lateral arm is provided on its outer curved portion with an ordinary screw-cap, I<sup>2</sup>, permitting easy access to the overflow-valve when desired.

The operation is as follows: Steam being admitted into the jet-pipe passes through the tapered passage thereof into the lifting-tube, causing the lifting of the water into the water-supply chamber through the lifting-tube and out into the overflow-chamber, while that which enters the combining-tube passes out through the series of apertures in the lower end thereof into the cylindric casing or jacket G, and, passing up around the outside of the combining-tube, will force the lifting-valve from its seat on the upper end of the casing or jacket, and the rapid flow of water forces said valve up sufficient for the vacuum within the ring d to bring it to its seat against the lower edge of the chamber or ring d, thus closing or cutting off the inflow of hot water over mouth of the combining-tube, enabling the injector to be started with a low pressure of steam, and as soon as the injector starts the hot water ceases to flow through the apertures in the combining-tube. Should the sliding valve happen to remain in its elevated position against the chamber or ring d, upon restarting the injector the steam-jet will force the same down on the upper edge of the casing or jacket until removed by the current of hot water created by the passage of the same up through said casing or jacket, as above detailed. It will be understood, of course, that the water which passes into the overflow-chamber effects the raising of the overflow-valve from its seat, permitting the escape thereof. When the injector is working, the steam and water will pass through the passage of the delivery-tube, and striking against the inner end of the plug I<sup>3</sup>, will pass out through the apertures formed in its inner portion on to the boiler.

From what has been said it will be seen that my invention is operated by a current of hot water passing through the combining-tube into the cylindrical chamber, whereby the inflow

over the mouth of the combining-tube is closed, permitting the starting of the injector at a low pressure of steam, which is a desideratum in this class of inventions; and it will also be seen that the spill or overflow of the combining-tube empties through the relief-holes directly into the inclosing casing or jacket or secondary relief surrounding the same, which is one of the principal features of my invention. By this means the passage of the overflowing water is at two points when the water is first turned on, and after entering the combining-tube the water passes through the relief ports or apertures into an inclosing casing or jacket, which passing of the water, through the agency of the valve, closes the inflow of hot water over the mouth of the combining-tube and permits the ready starting of the injector, as above set forth.

I claim as my invention—

1. The herein-described method of starting an injector at a low pressure of steam, consisting in closing the inflow of hot water by means of a lifting-valve operated by a current of water passing from the combining-tube and striking against the under side of said valve, substantially as set forth.
2. In an injector, the combining-tube having apertures or relief-holes at its lower end for emptying the spill or overflow directly into a cylindric casing or jacket or secondary relief inclosing and fitted upon said end of the combining-tube, as and for the purpose set forth.
3. In an injector, the narrow combining-tube, the cylindric casing or jacket inclosing and fitted upon the end of the same, and the lifting-valve fitted on said combining-tube, substantially as shown, and for the purpose set forth.
4. The combination, with the casting or tubular casing and its compartments, of the lifting-tube having a circular chamber or ring, the stationary combining and delivery tubes, the cylindric casing or jacket inclosing and fitted upon the end of said combining-tube, and the lifting-valve for opening and closing the opposite ends of said casing or jacket and circular chamber or ring, substantially as shown and described.
5. The combination, with the tubular casing or casting, the steam-jet, and the lifting-tube having the circular chamber or ring, of the combining-tube having apertures at its lower end, the inclosing casing or jacket forming a space around and fitted upon the end of said combining-tube, and the lifting-valve having a flat upper face and an under beveled surface, substantially as shown, and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN DESMOND.

Witnesses:

FRANK D. ANDRUS,  
S. OLIN JOHNSON.